



Energy Technologies Area

Lawrence Berkeley National Laboratory

## National Survey of Attitudes of Wind Power Project Neighbors

March 13<sup>th</sup>, 2018: Webinar 4 of 4

# Comparing Strongly Annoyed Individuals with Symptoms Near U.S. Turbines To Those In Surveyed European Communities

## Preliminary Results

### Please Note:

- All participants will be muted during the webinar
- Please submit questions via the chat window
- This webinar will be recorded

### Gundula Hübner and Johannes Pohl

University Halle-Wittenberg and  
Medical School of Hamburg Germany

### Ben Hoen

Lawrence Berkeley National Laboratory  
Electricity Markets and Policy Group



# About the authors

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## Gundula Hübner

- Professor of Social Psychology at the MSH Medical School Hamburg
- Professor of Environmental Psychology at the Martin-Luther-University Halle-Wittenberg
- Focus on the social acceptance of renewable energies, on- and offshore wind energy
- Expert on stress impact of wind turbines on residents as well as persuasive communication to promote sustainable behavior



## Johannes Pohl

- Senior researcher at the MSH Medical School Hamburg and the Martin-Luther-University Halle-Wittenberg, Germany.
- Focus on the social acceptance of renewable energies, on- and offshore wind energy, the stress impact of wind turbines on residents
- Expertise in stress- and bio psychology



# Outline Of The Presentation

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**Part I. National Survey Project Background**

**Part II. Survey Frame Overview**

**Part III. Comparing Strongly Annoyed Individuals  
with Symptoms Near U.S. Turbines To Those  
In Surveyed European Communities**

**Part IV. Next Steps & Outreach**

# National Survey of Attitudes of Wind Power

## Project Neighbors: Project Overview

**Project PI:** Ben Hoen, Research Scientist, LBNL

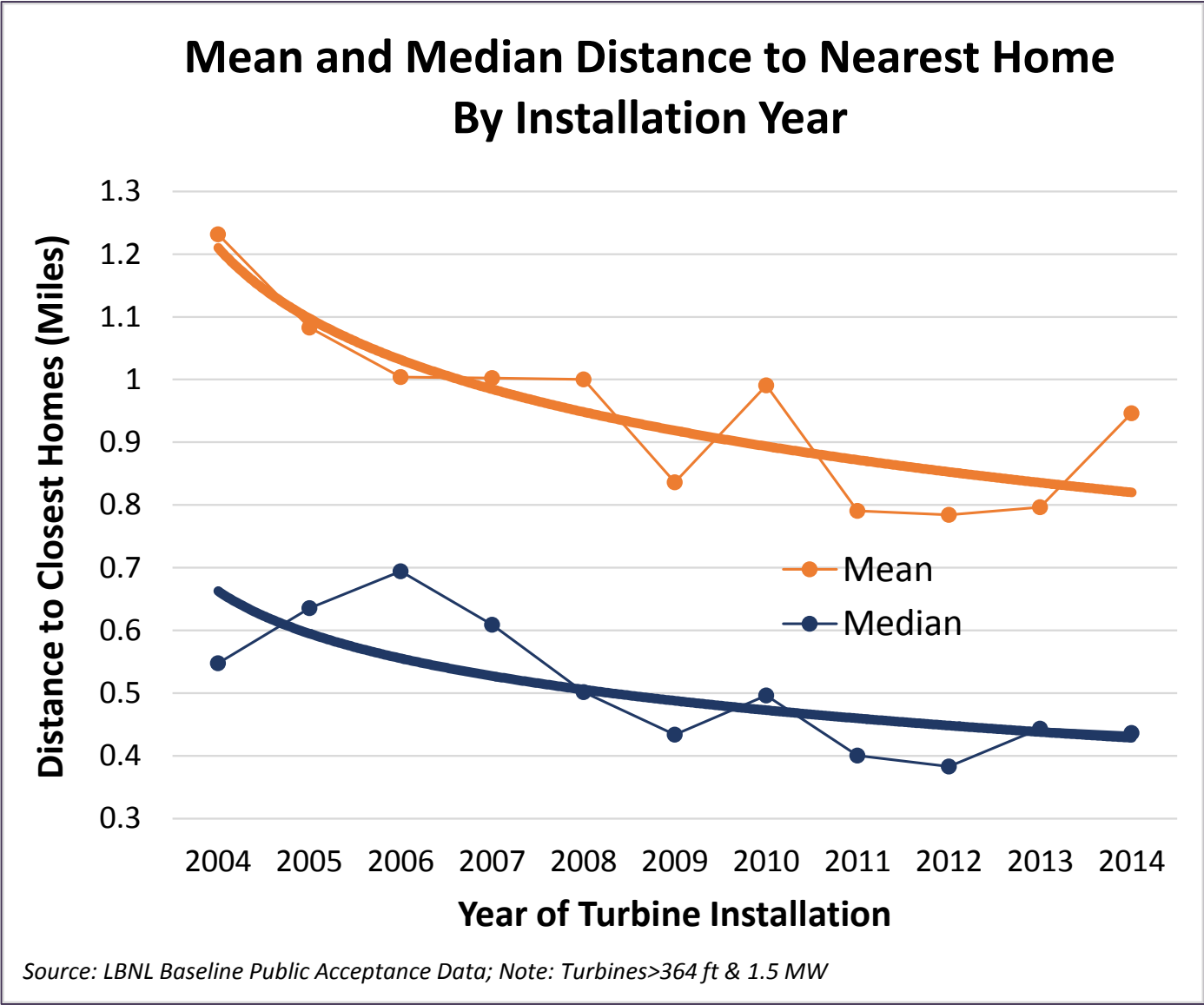
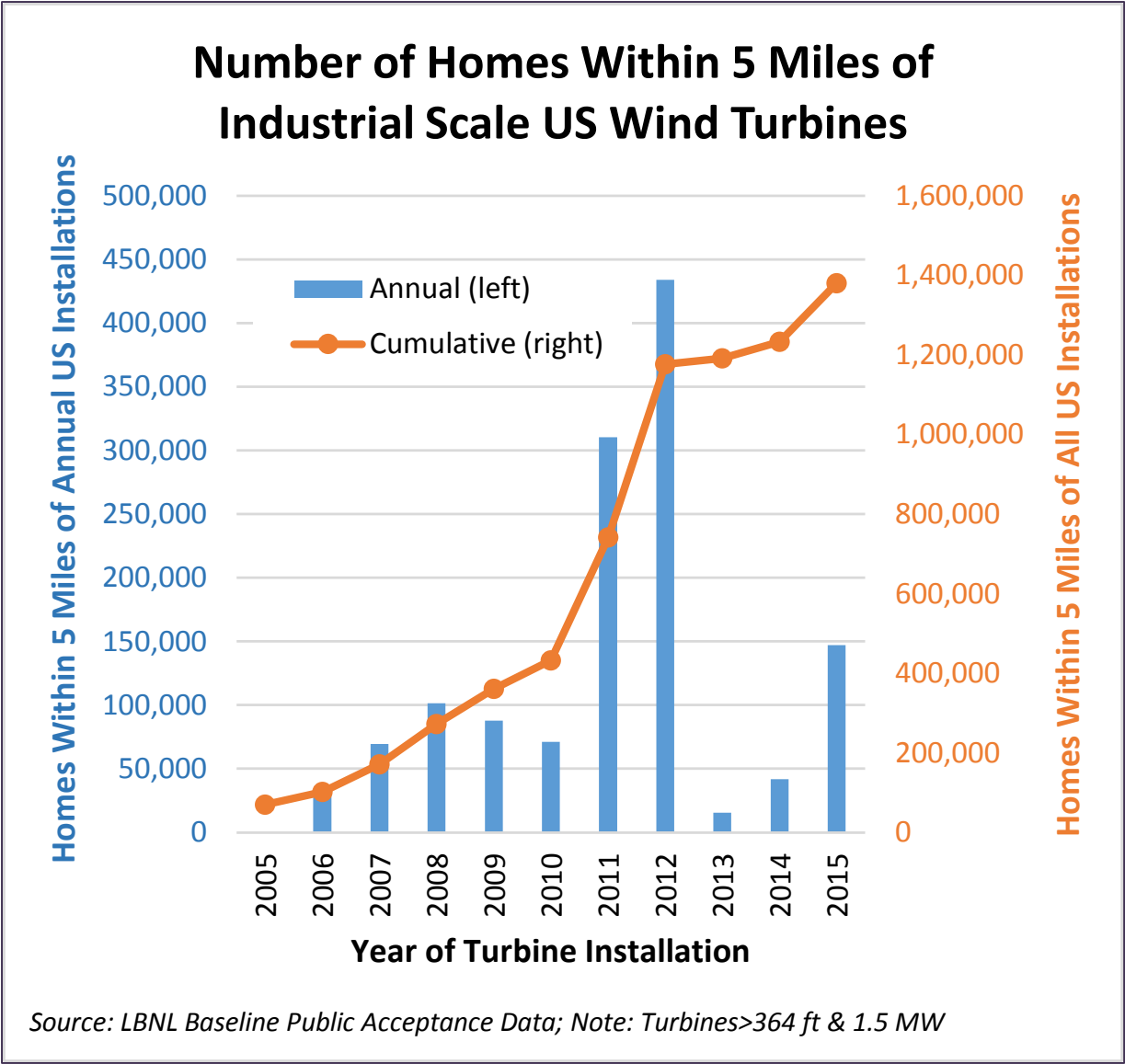
### Collaborating Researchers:

- **LBNL:** Joe Rand, Ryan Wiser
- **University of Delaware:** Jeremy Firestone
- **Portland State University:** Debi Elliott
- **University Halle-Wittenberg, Medical School of Hamburg:**  
Gundula Hübner, Johannes Pohl
- **NREL:** Eric Lantz
- **Resource Systems Group, Inc:** Ryan Haac, Ken Kaliski, Matt Landis

**Project Years:** FY2015-FY2018; **DOE Program:** Wind Energy Technologies Office



# The Cumulative Number of Homes Near Turbines Is Increasing, While the Distance to the Nearest Homes Is Decreasing



# National Survey of Attitudes of Wind Power Project Neighbors: Project Objectives

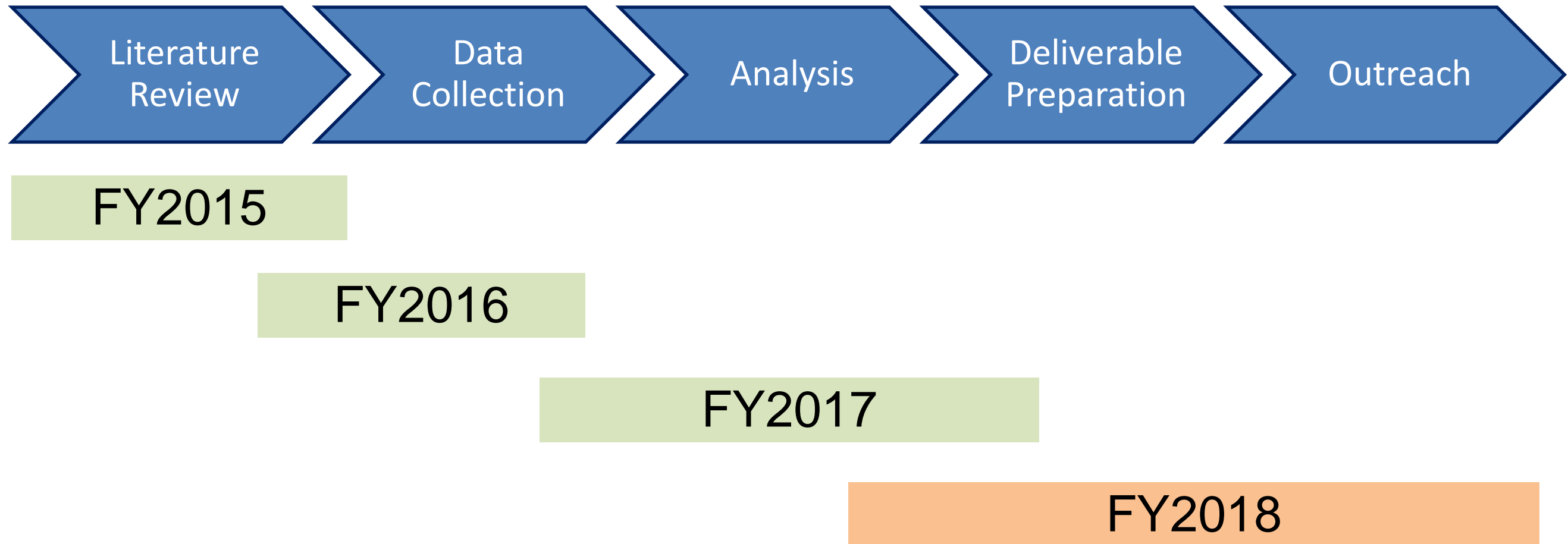
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- Provide first-of-its kind **broad-based, representative** information on public acceptance issues surrounding wind facilities in the **United States**.
- Allow a **wide array of stakeholders to better understand** the attitudes & annoyances towards wind energy in local communities in the US and the main correlates to those perceptions.
- Allow **greater confidence in the likely effects** of proposed wind energy projects by increasing knowledge about existing projects.
- Potentially help **inform wind stakeholder & DOE R&D** priorities to increase benefits and reduce costs of the next-generation wind technologies and deployments.

# Baseline Public Acceptance Analysis

## Timeline

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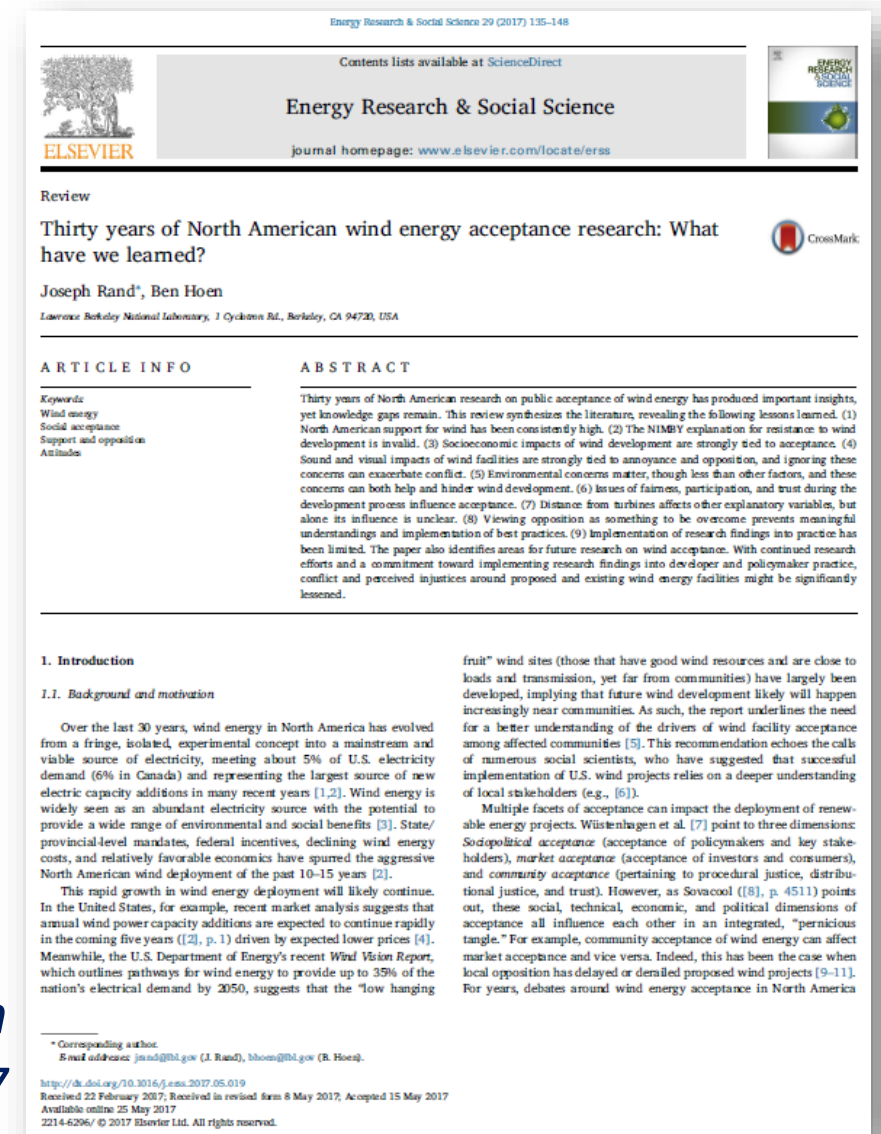
# Literature Review: “Thirty years of North American wind energy acceptance research: What have we learned?”

**Project Lead(s):** Rand

**Collaborating Researchers:** Hoen

**Purpose:** (1) to summarize North American wind energy public acceptance literature with a focus on some of the key correlates; and (2) to identify research gaps that the current research might help address

*Published in Energy Research and Social Science, July, 2017*



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# Multi-Model Survey Conducted in 2016

## Sampling Steps

- Pilot phone survey (December 2015)
- Phone survey (March 2016)
- Internet & mail survey (June-July 2016)
- 1705 valid responses (22% overall response rate)

**22-minute survey  
~ 50 questions**

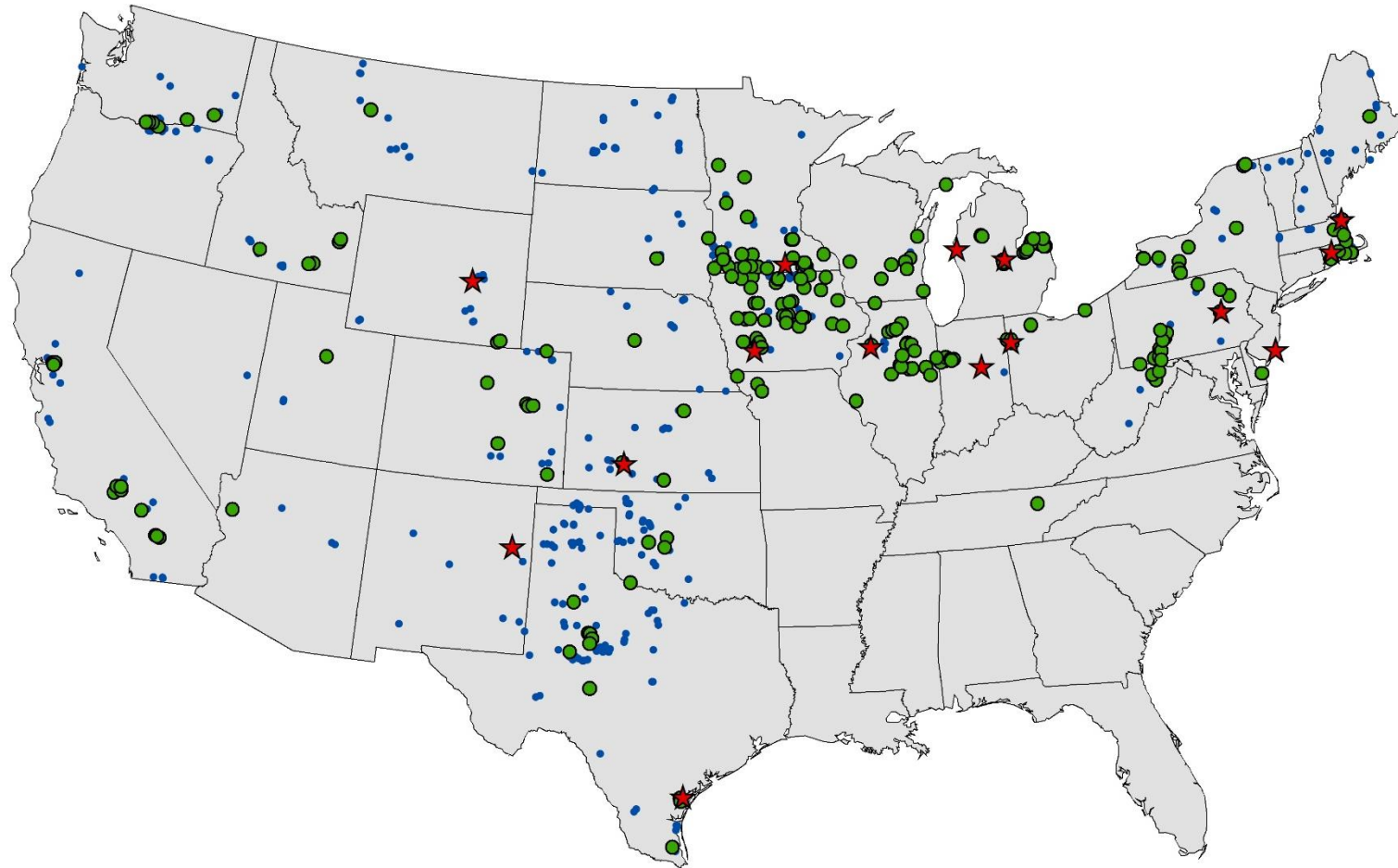


Images: [www.mmrstrategy.com](http://www.mmrstrategy.com)



[www.brookmark.com](http://www.brookmark.com)

# Responses Collected Near 250 Wind Power Projects Across 24 States, From The Full Sample Of 604 Projects



- projects sampled without modeled sound ( $n = 235$ )
- ★ projects sampled with modeled sound ( $n = 15$ )
- non-sampled projects (through 2014) ( $n = 354$ )

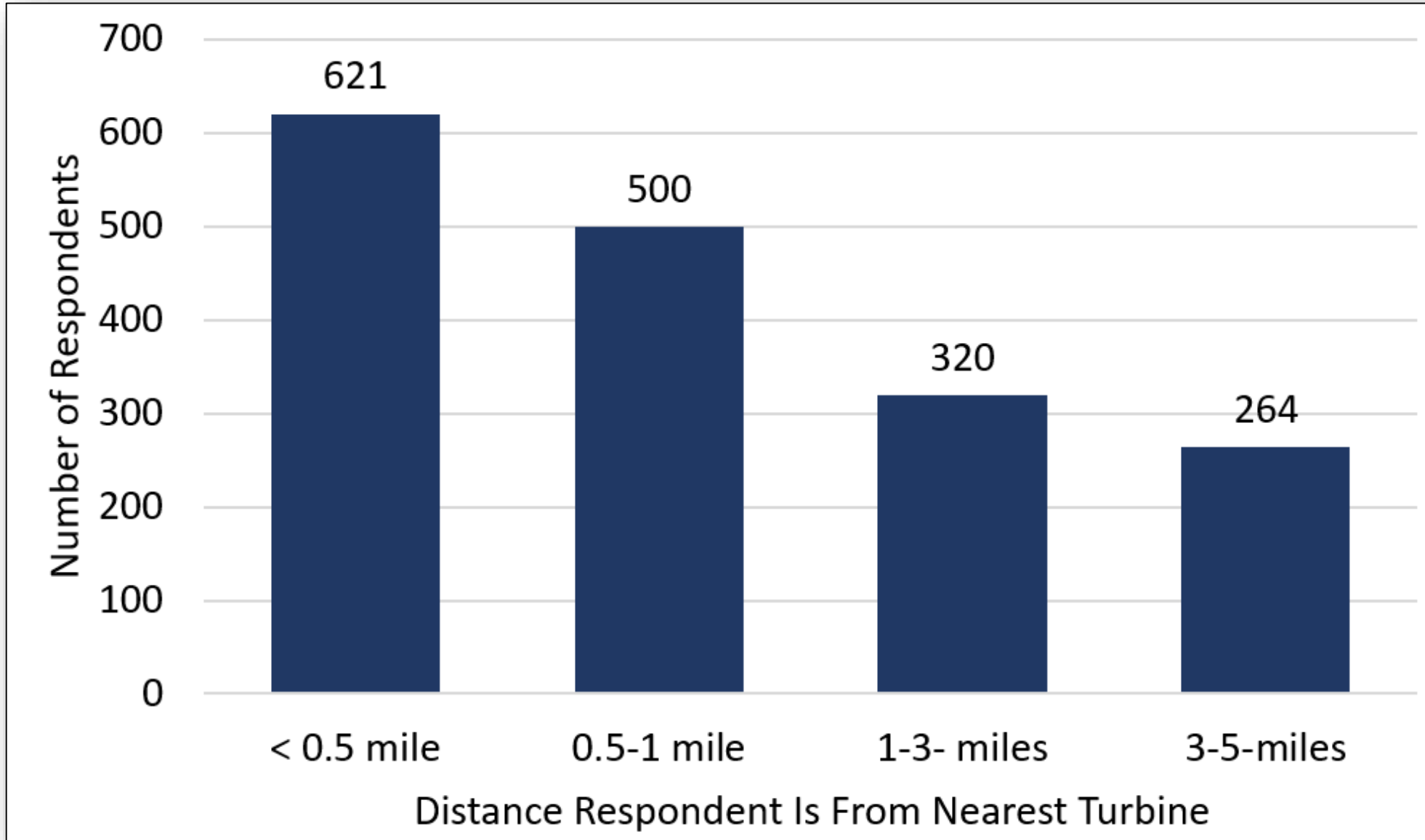
**Random sample of residences  
within 5 miles of a modern  
wind turbine**

- $\geq 364$  feet tall
- $\geq 1.5$  MW

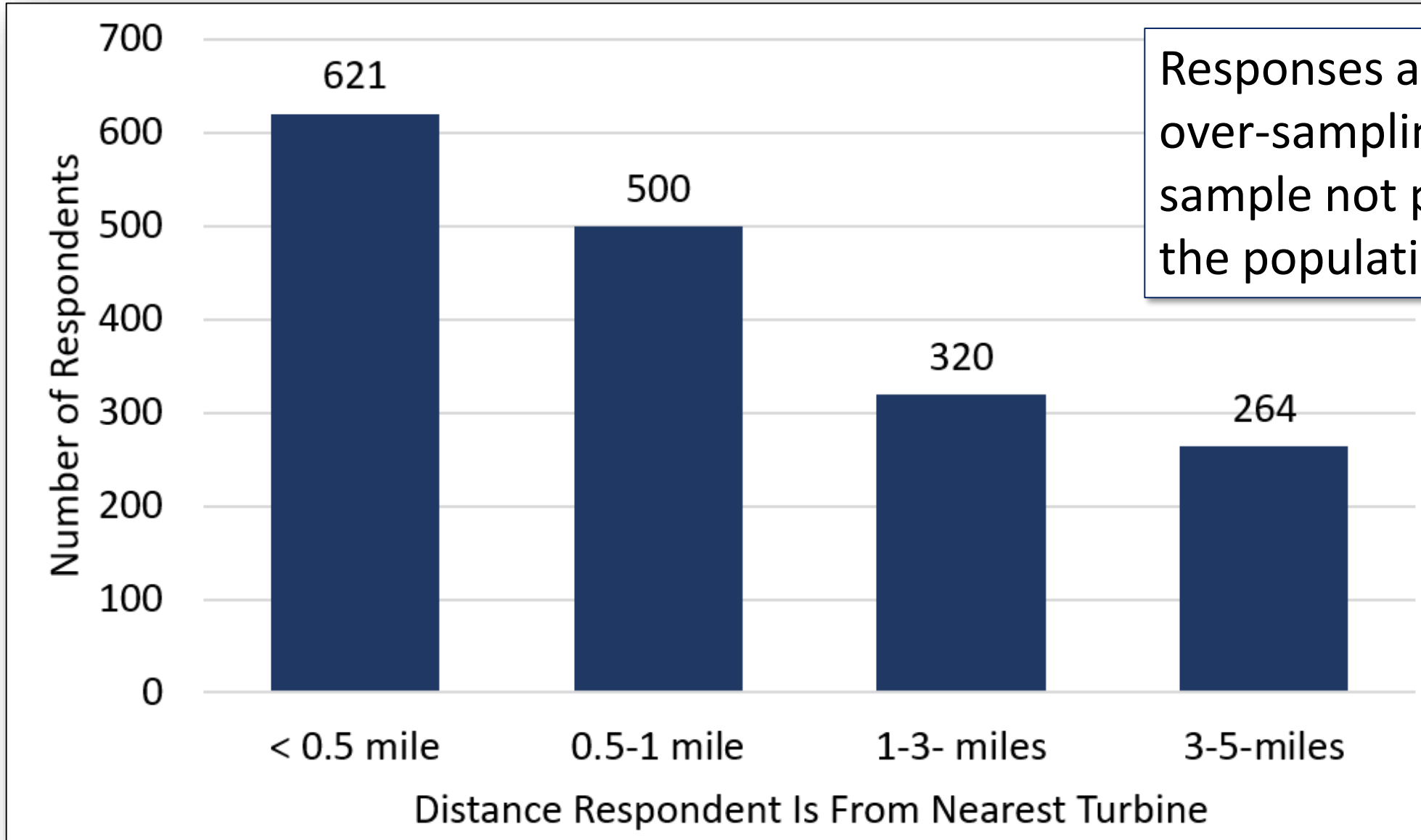
**Oversampled**

- close to ( $<1$  mile) turbines
- large projects ( $>10$  turbines)
- where sound was modeled

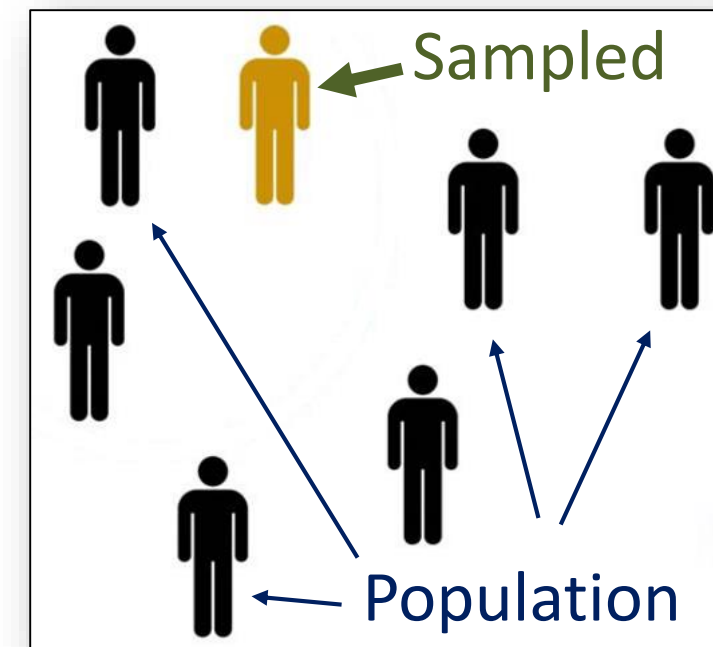
# Final Responses By Sampling Cohort ( $n = 1705$ )



# Final Responses By Sampling Cohort ( $n = 1705$ )



Responses are weighted to account for over-sampling and to adjust for a sample not perfectly representative of the population



# National Survey of Attitudes of Wind Power Project Neighbors: Analysis Areas

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## Overall Analysis Areas

- Review of North American Wind Acceptance Literature
- Overall Analysis of Attitudes of 1,705 Wind Project Neighbors

## Topic Specific Analysis Areas

- Planning Process Fairness and Attitudes
- Predicting Audibility of and Annoyance to Wind Project Sounds Using Modeled Sound
- ➔ • Comparing Strongly Annoyed Individuals with Symptoms Near U.S. Turbines To Those In Surveyed European Communities

## \*\*\* Preliminary Results \*\*\*

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- Results have not been submitted to nor reviewed for a peer-reviewed journal.
- The results could change as work progresses.
- Changes to the results could change some of the conclusions.
- If you wish to cite these results, use the following:

*Hübner, G., J. Pohl, B. Hoen, J. Firestone, J. Rand, D. Elliott (2018) Comparing Strongly Annoyed Individuals with Symptoms Near U.S. Turbines To Those In Surveyed European Communities. Lawrence Berkeley National Laboratory. Preliminary Results Webinar. March 13, 2018.*

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# Comparing Strongly Annoyed Individuals With Symptoms Near U.S. Turbines To Those In Surveyed European Communities

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**Project Lead(s):** Hübner, Pohl, Hoen

**Collaborating Researchers:** Firestone, Rand, Elliott

**Purpose:** To investigate individuals who are “strongly” annoyed (i.e., annoyed with symptoms), and compare results between this U.S. study and other studies in Europe, to examine differences and correlates

**Numbers of Respondents:** 1441 (respondents within 3 miles)

**Primary Analysis Methodology:** t- & Chi<sup>2</sup>-tests; Pearson correlation; regression analysis

# Methods

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- Comparison between US and European residents
- Distance < 3 miles to the nearest wind turbine
- Weighted US data, unweighted European data
- N, M, SEM, %; figures:  $M \pm SEM$
- t-test,  $\chi^2$ -test, Pearson correlation
- Multiple regression with unweighted US data
- Effect sizes used for this analysis:
  - Cohen's d (for t-test):  
“not relevant/negligible” <0.2; “small” 0.2–0.49; “medium” 0.5–0.79; “large”  $\geq 0.8$
  - w (for  $\chi^2$  test):  
“not relevant/negligible” <0.1; “small” 0.1-0.29; “medium” 0.3-0.49; “large”  $\geq 0.5$

# Three European Samples Using The Same Survey Questions Are Compared To The U.S. Results

<i>Note: Respondents for the papers listed were limited to those within 3 miles. Statistics refer to those subsamples.</i>	<b>Pohl et al. (2012)</b>	<b>Pohl et al. (2018)</b>	<b>Hübner &amp; Löffler (2013)</b>	<b>Combined European Dataset</b>
Country	Germany	Germany	Switzerland	<b>Multiple</b>
<i>n</i> : <3 miles (total shown in paper)	372 (420)	212 (212)	445 (467)	<b>1029</b>
Average age	51	55	52	<b>52</b>
Gender (male; female)	59%; 41%	52%; 48%	48%; 52%	<b>53%; 47%</b>
Number of wind projects	13	1	7	<b>21</b>
Wind turbines per project (WT)	5–18	9	1–16	<b>1-18</b>
WT total height: feet (meters)	387–492 (118–150)	492 (150)	236–485 (72–148)	<b>236–492 (72–150)</b>
WT capacity (MW)	0.8–2.3	2.0	0.6–2.0	<b>0.6-2.3</b>
Distance range to home (miles)	0.37–1.24	0.78–1.80	0.14–2.98	<b>0.14–2.98</b>
Average distance to home (miles)	0.83	1.18	1.23	<b>1.08</b>

# The Samples Are Largely Comparable In Terms Of Key Demographic Variables

<i>Mean (Standard Error of the Mean - SEM)</i>	<b>USA</b>	<b>Europe</b>	<b>Effect size <i>p</i>-value</b>
Age <i>n</i>	56.92 (0.43) 1407	52.22 (0.47) 1015	small (0.30) < .0001
Gender <i>n</i>	45% (m); 55% (f) 1428	53% (m); 47% (f) 1018	not relevant (0.08) < .0001

# Overall Attitudes In Both Samples Are Positive, With Europeans Being Slightly More Positive

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<i>Mean (SEM)</i>	<b>USA</b>	<b>Europe</b>	<b>Effect size <i>p</i>-value</b>
Present attitude towards wind farm <i>n</i>	0.72 (0.03) 1416	1.00 (0.05) 987	small (0.22) < .0001

*Scale: −2 (very negative) to +2 (very positive)*

# U.S. Residents Perceive The Planning Process As More Fair, But Are More Annoyed By It

But in both samples, the mean annoyance levels are quite low.

Mean (SEM) <i>n</i>	USA	Europe	Effect size <i>p</i> -value
Perceived planning process fairness	2.31 (0.06) 692	1.62 (0.05) 906	small (0.48) < .0001
Annoyed by planning and construction process	0.90 (0.05) 769	0.56 (0.04) 1000	small (0.26) < .0001

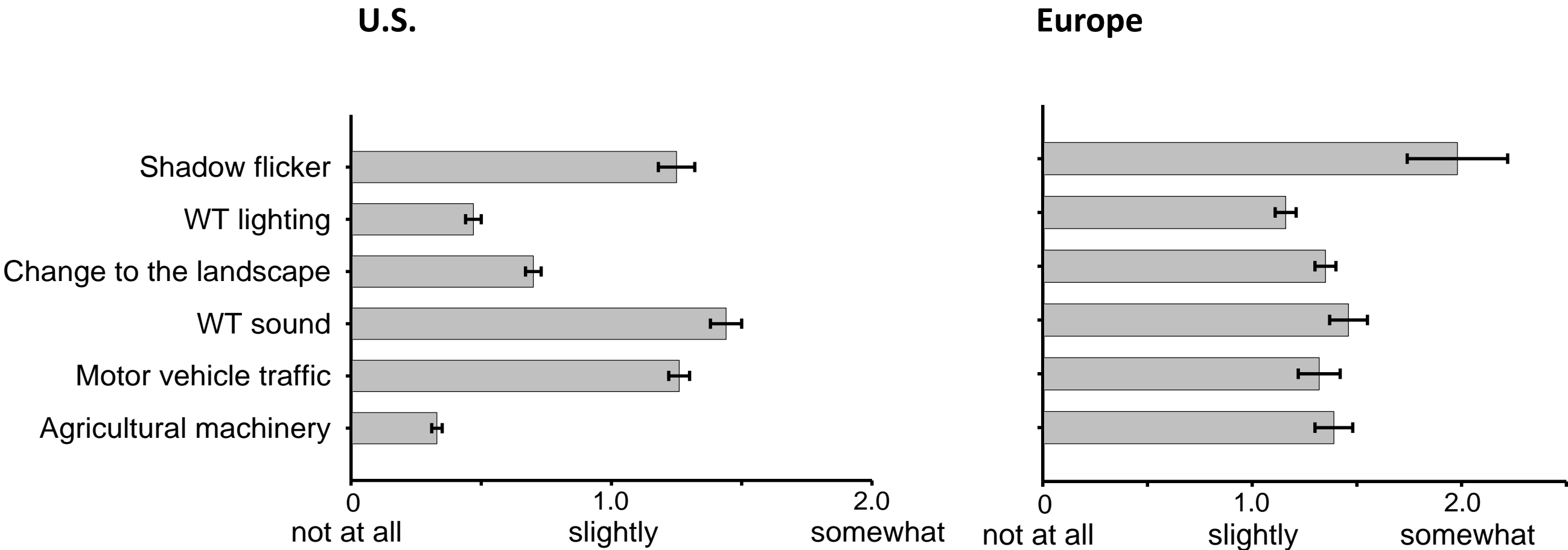
*Scale: 0 (not at all) to 4 (very)*

# Consistently Lower U.S. Incidences Of Both Hearing the Wind Project And Experiencing Shadow Flicker

% <i>n</i>	U.S.	Europe	Effect size <i>p</i> -value
Blades cast shadow, outside home	3.3% 1423	8.8% 467	small (0.11) < .0001
Blades cast shadow, inside home	2.3% 1434	8.8% 467	small (0.15) < .0001
Can hear wind farm, outside home	10.9% 1434	41.0% 671	medium (0.35) < .0001

*Note: The European sample respondents are, on average, closer to the turbines than the U.S. respondents, which might explain the higher %s. (USA: M = 1.68 miles, SEM = 0.02; Europe: M = 0.99 miles, SEM = 0.01; Effect size: large (d=1.24), p<.0001).*

# Overall, Relatively Low Annoyances Within 3 Miles: Wind Turbine Sound Is Greatest in U.S., Followed By Shadow Flicker



# Roughly 8% Have Claimed To Have Experienced Negative Effects From U.S. Wind Projects; Most Cope By Talking To Others

Have you ever experienced any negative effects from the wind project?	Overall %	U.S. Only ( <i>n</i> =1441)
	7.8%	

How have you coped...?	Overall %	% of Those Affected
Talked with others	5.7%	74%
Tried to relax	4.1%	52%
Accepted it	3.8%	49%
Ignored it	3.6%	46%
Reduced its effects (e.g., sound dampening, shutting windows, closing blinds)	3.1%	40%
Avoided it	3.0%	39%

# U.S. Symptoms Related To Annoyances Are Rare, Appear Most Often For Sound – Comparable To Europe (See Supplemental Slides)

## U.S. Only

## Turbine Annoyances

Reported Symptoms Occurring At Least Monthly	Sound	Landscape Change	Lighting	Shadow Flicker
<i>n</i>	1441	1441	1441	1441
Being in a bad mood	3.3%	2.6%	1.8%	2.3%
Anger	1.1%	1.9%	1.7%	0.6%
Lack of concentration	2.4%	0.6%	0.7%	1.3%
Difficulty falling asleep	3.2%	0.6%	1.0%	0.6%
Otherwise not sleeping well	2.7%	0.5%	1.1%	0.6%

# Definition Of Annoyance Stress Scale

A Combination Of Annoyance Level And Symptom Frequency

## Annoyance Level

Have Not Experienced Sound or Flicker	Not At All	Slightly	Somewhat, Moderately, or Very	Somewhat, Moderately, or Very
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## Symptom Frequency

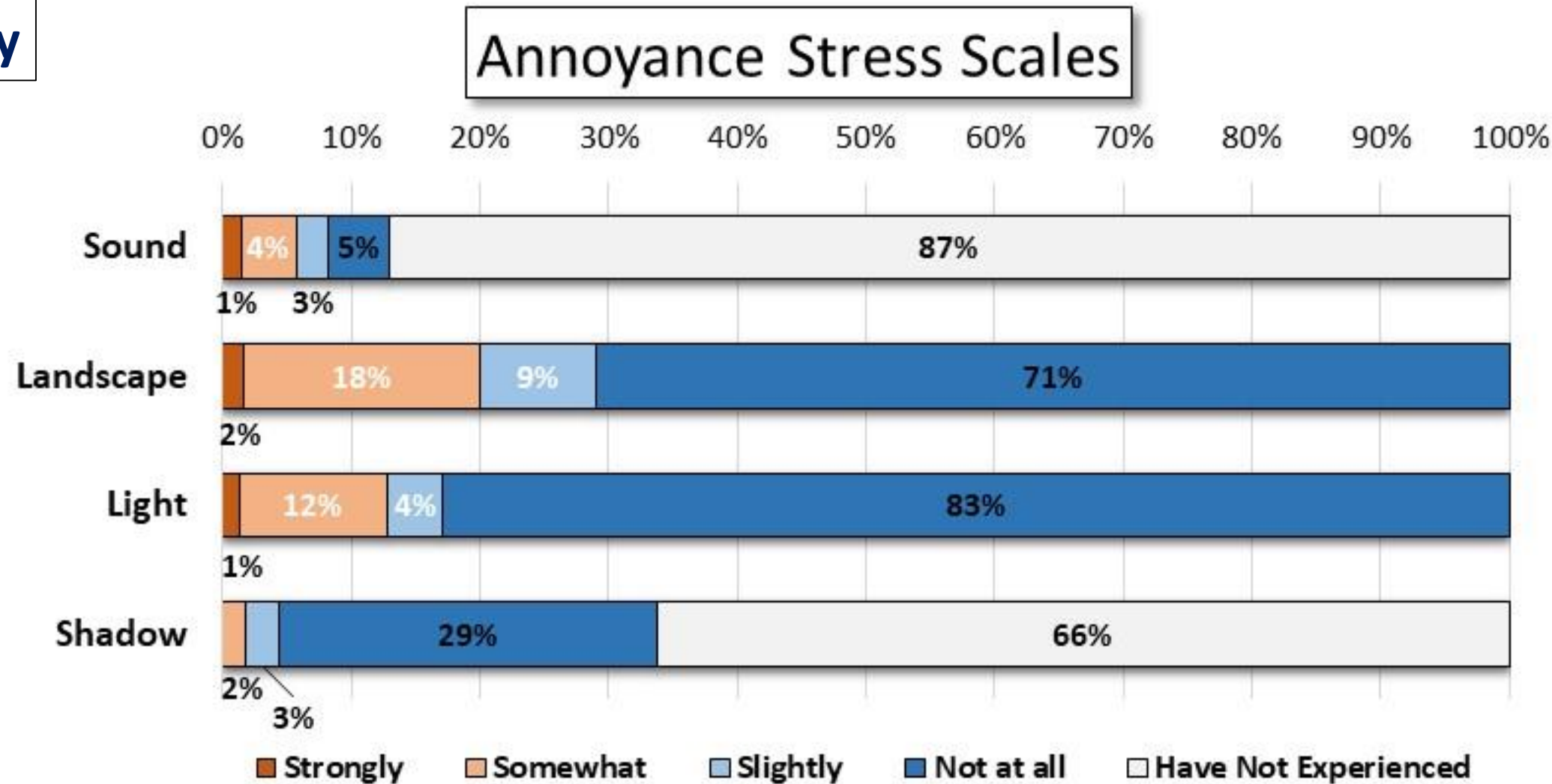
Not Applicable	Not Applicable	No Symptoms	No Symptoms	Monthly, Weekly, or Daily
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## Annoyance Stress Scale

Not Experienced Sound or Flicker	Not at all	Slightly	Somewhat	Strongly
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# 18% Are Somewhat Annoyed By Landscape But Overall, Stress Related Annoyance Is Very Rare

U.S. Only



Data are weighted and only include respondents within 3 miles of a turbine

# “Strongly” Annoyed Stress Scale Residents Represent A Small Portion Of The Population. Few Differences Between US and European Annoyance Stress Levels

% (n) <sup>a</sup> total n	U.S.	Europe	Effect size p-value
Sound	1.1% (16) 1441	4.3% (28) 657	small (0.102) < .0001
Landscape Change	1.5% (22) 1441	0.0% (0) 445	not relevant (0.060) .009
Lighting	1.2% (18) 1441	1.2% (10) 817	not relevant (0.001) .959
Shadow Flicker	0.2% (3) 1441	0.2% (1) 445	test not possible
Total	2.3% (33) 1441	3.7% (38) 1029	not relevant (0.049) .041

<sup>a</sup>. In the U.S. the strongly annoyed n are estimated based on weighted percentage. In Europe they are the actual counts

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**Unless Noted, The Next Slides Focus Only On**  
**U.S. Respondents**  
**And**  
**Sound Annoyance Stress Scales (SASS)**

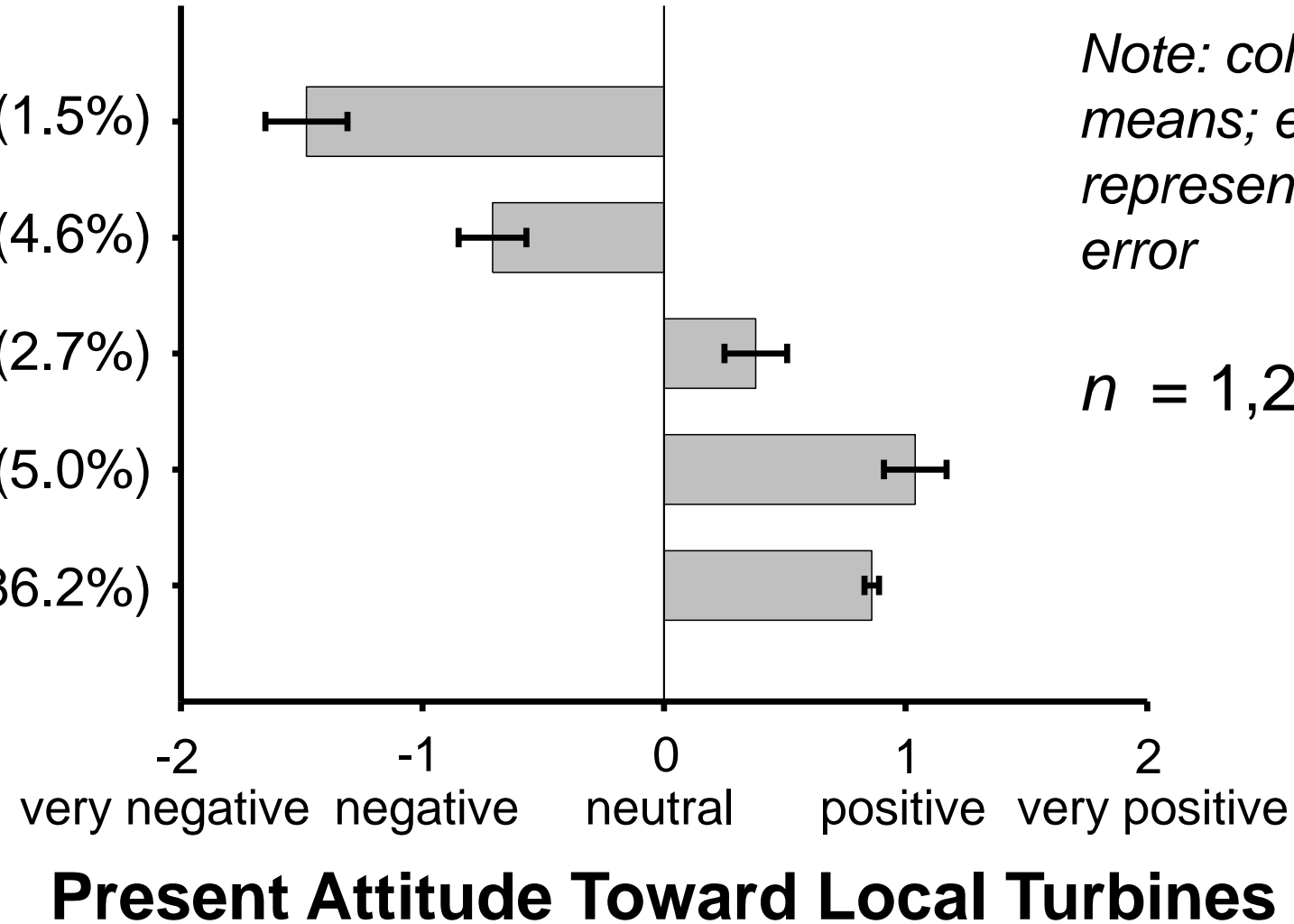
*Although the percentages of those that are “strongly” annoyed (i.e., with symptoms) are quite low for sound, landscape, shadow and lighting scales, the Sound Annoyance Stress Scales will be the focus for the remaining slides in the deck.*

# Focusing on Sound Annoyance Stress Scale (SASS)

## It Is Strongly Correlated With Present Attitude

Sound Annoyance  
Stress Scale

Strongly (1.5%)  
Somewhat (4.6%)  
Slightly (2.7%)  
Not at all (5.0%)  
Cannot hear (86.2%)



### Correlation

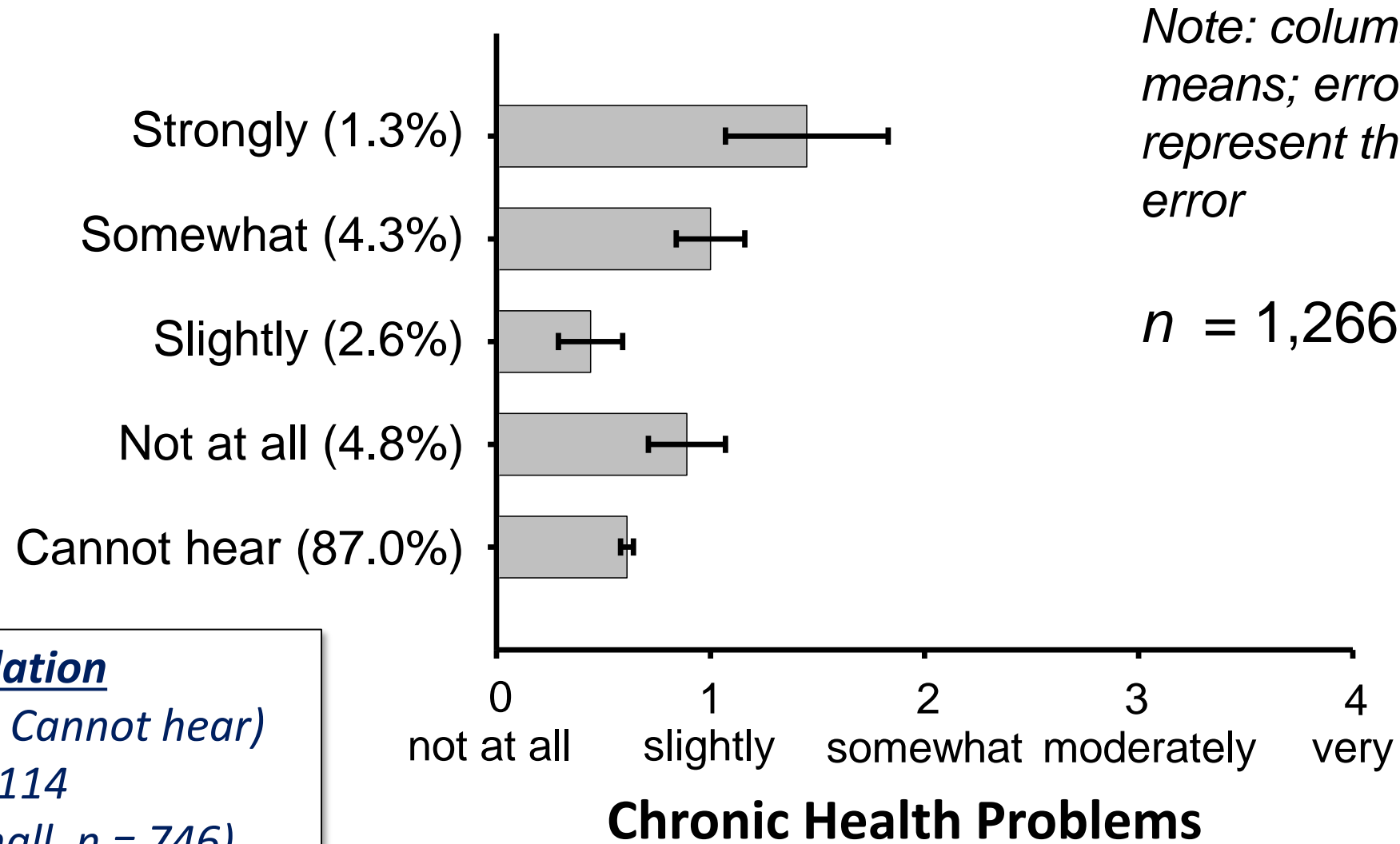
(Not including Cannot hear)

$$r = -.682$$

( $p < .0001$ , large,  $n = 773$ )

# Chronic Health Problems (Not Related To Wind Turbines) Are Negligibly Correlated To SASS

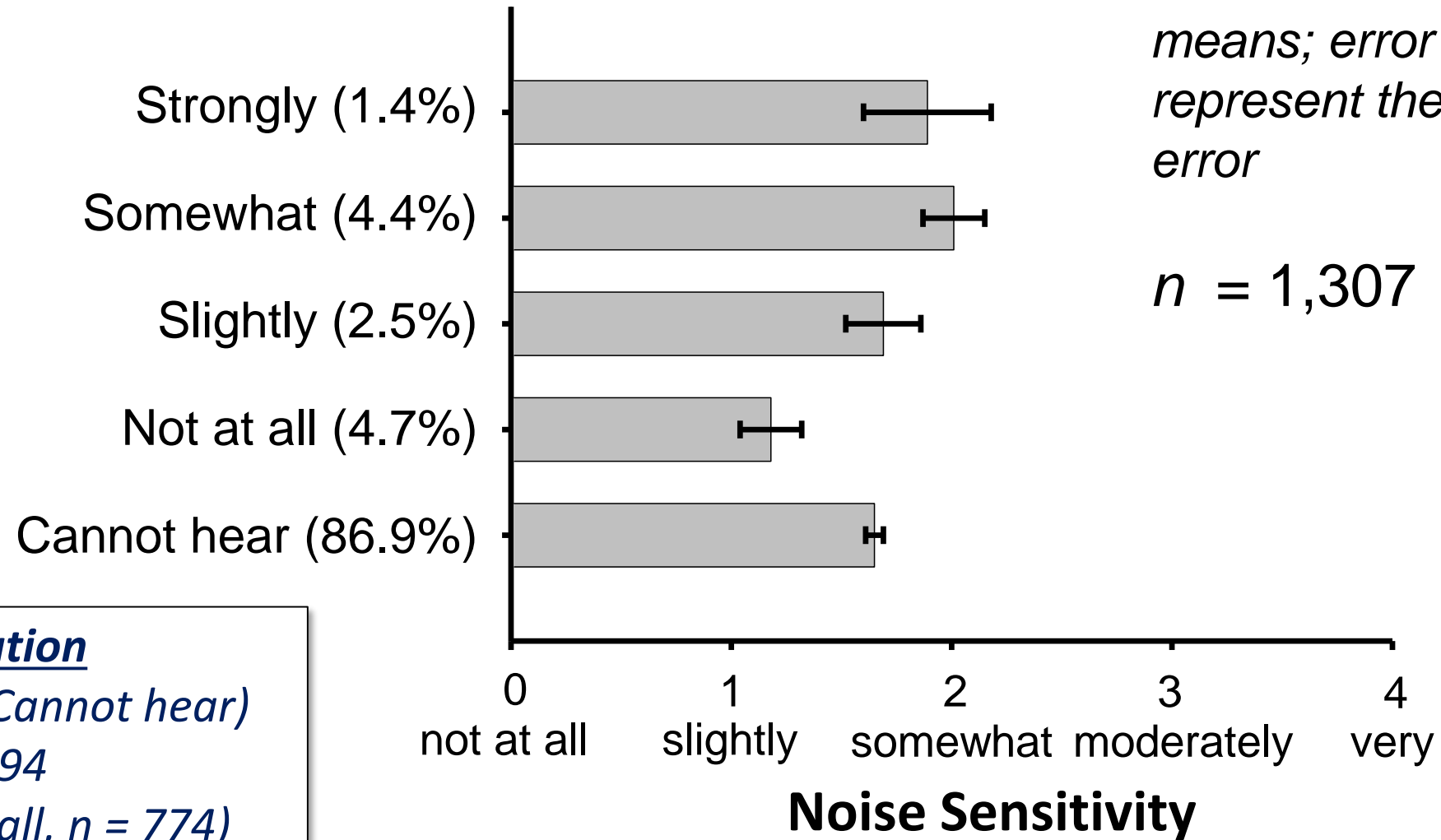
Sound Annoyance  
Stress Scale



Correlation  
(Not including Cannot hear)  
 $r = .114$   
( $p = .002$ , small,  $n = 746$ )

# Noise Sensitivity Is Negligibly Correlated With SASS

Sound Annoyance  
Stress Scale



## Correlation

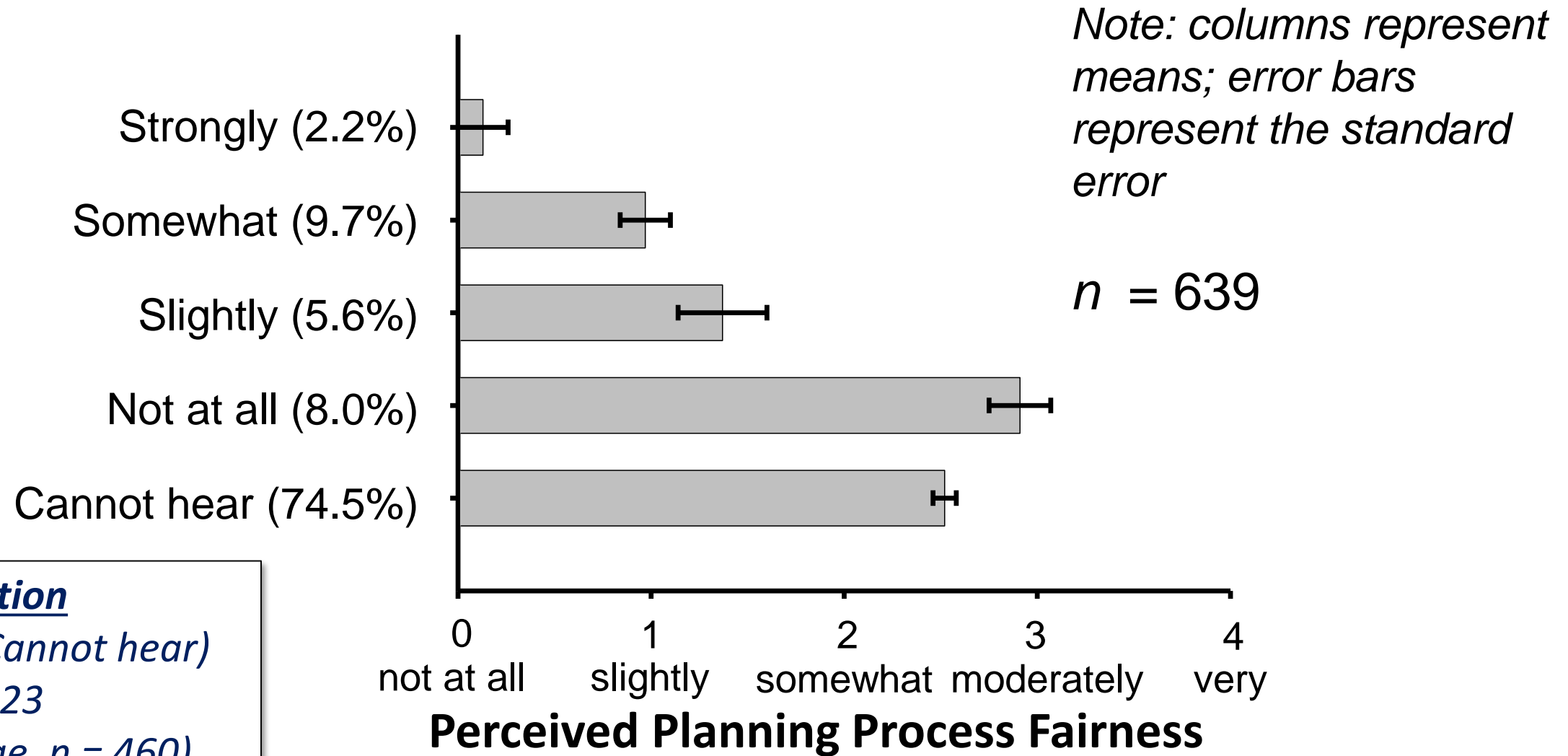
(Not including Cannot hear)

$r = .294$

( $p < .0001$ , small,  $n = 774$ )

# SASS Is Strongly Correlated With Perceived Planning Process Fairness

Sound Annoyance  
Stress Scale



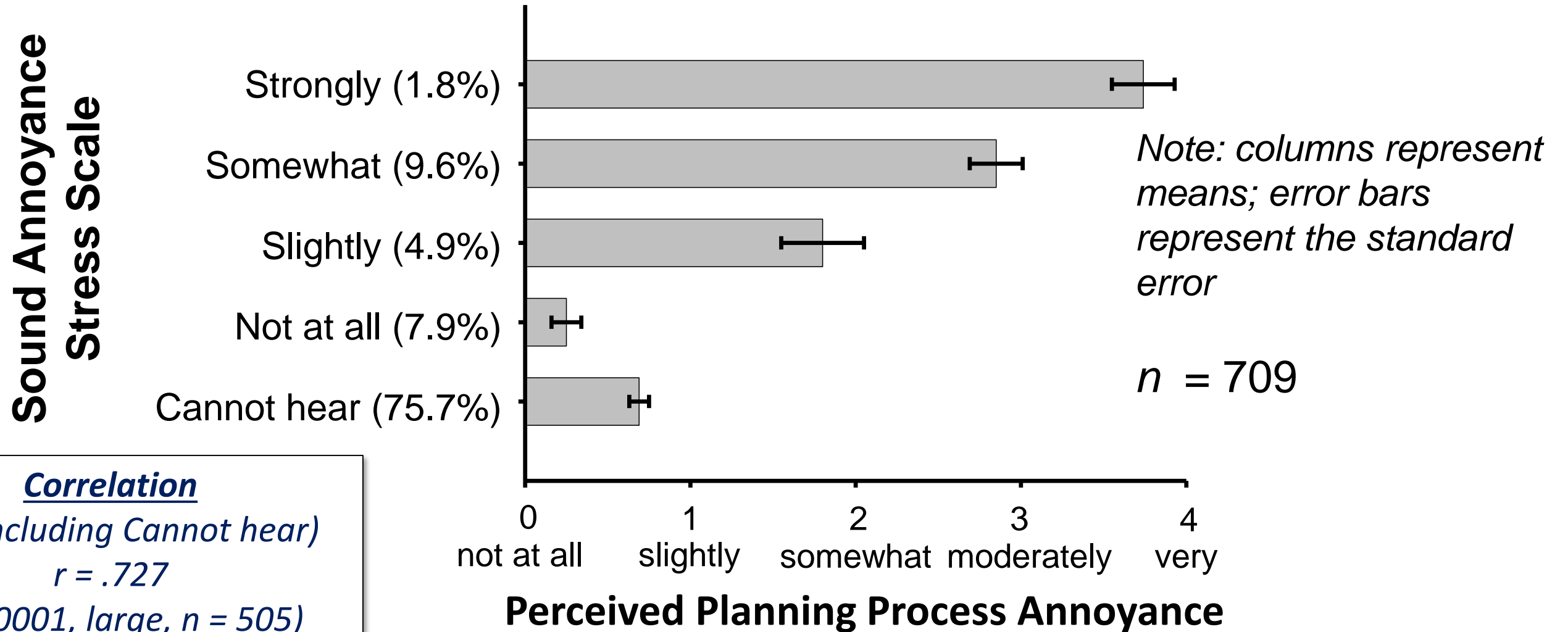
## Correlation

(Not including Cannot hear)

$$r = -.623$$

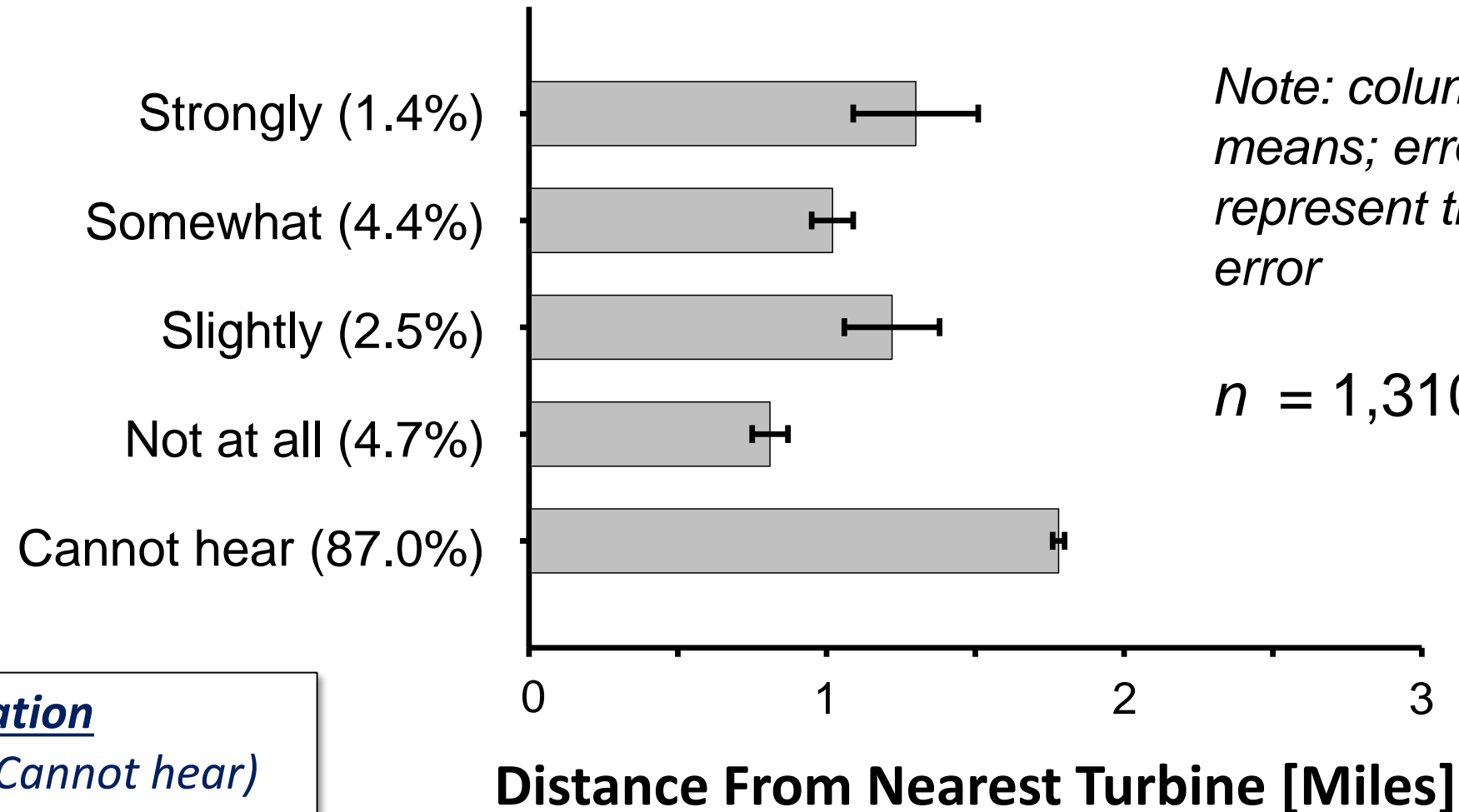
( $p < .0001$ , large,  $n = 460$ )

# Similarly, SASS Is Strongly Correlated With Planning Process Annoyance



# SASS Is Negligibly Correlated With Distance From The Turbines

Sound Annoyance  
Stress Scale



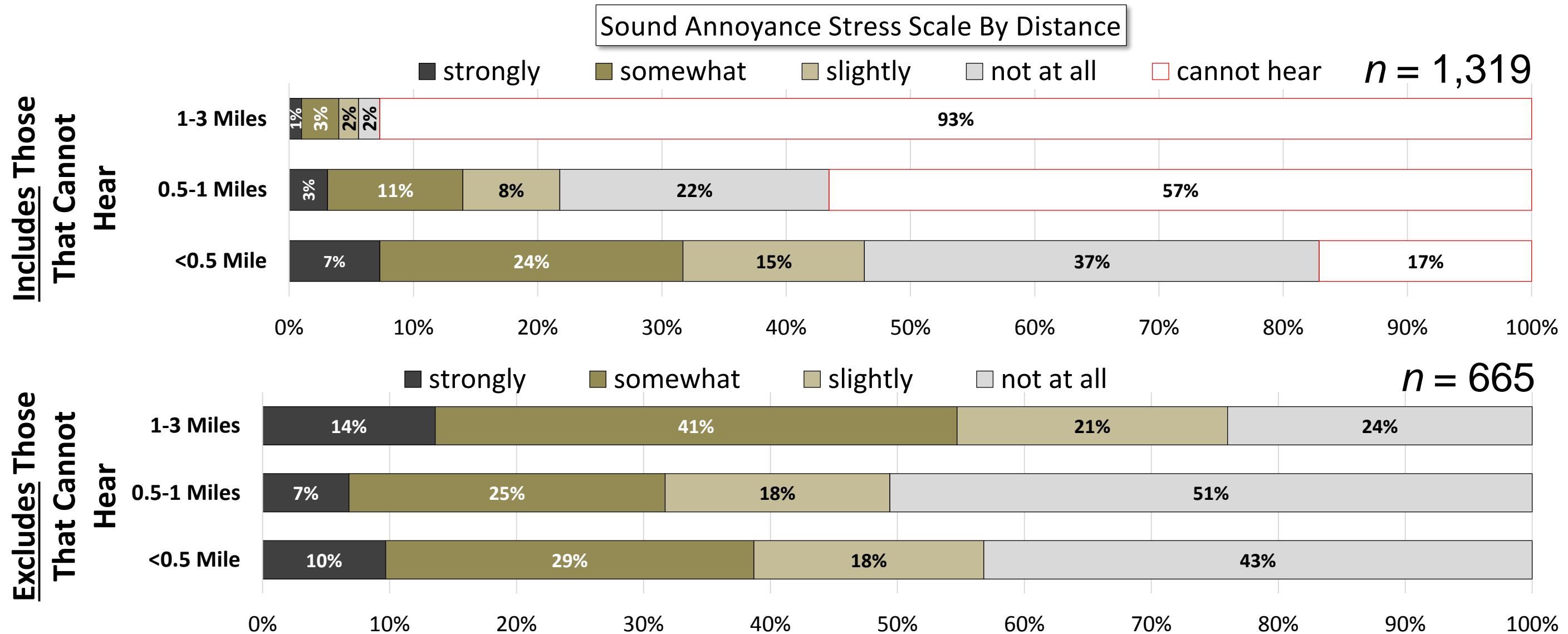
## Correlation

(Not including Cannot hear)

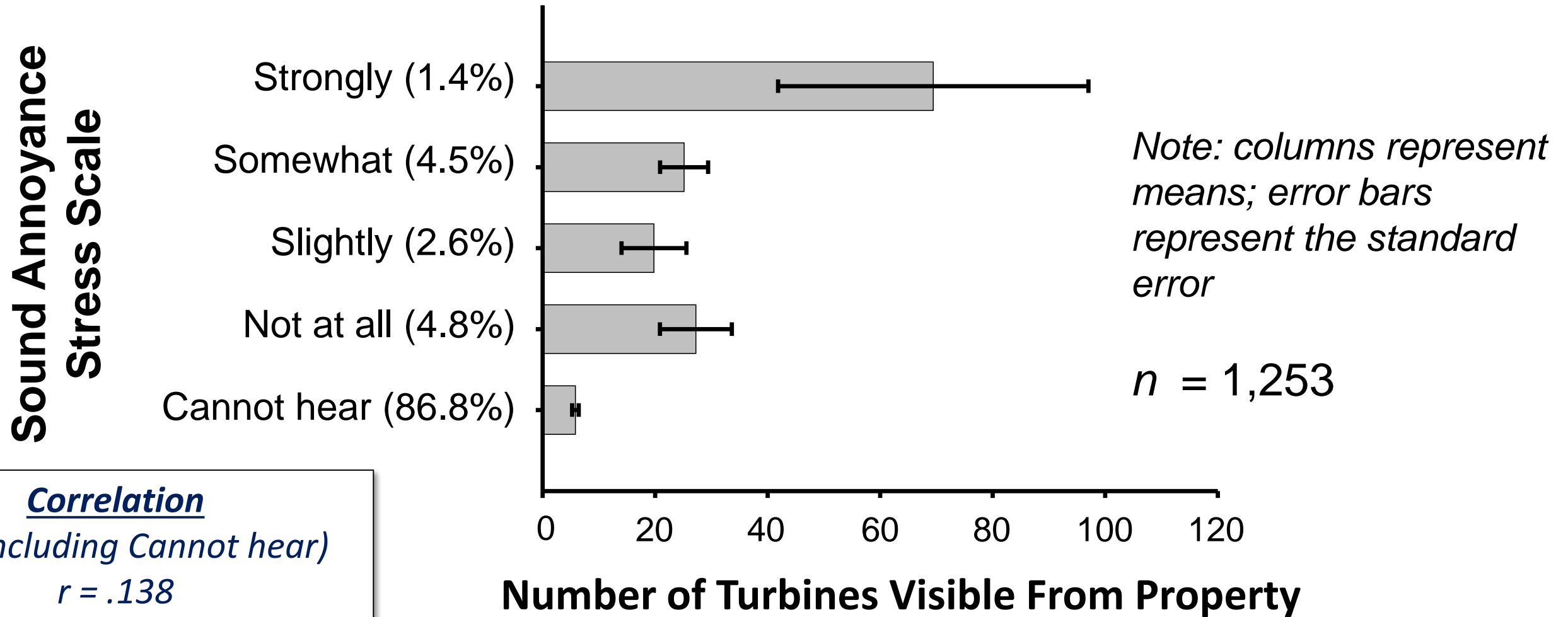
$r = .197$

( $p < .0001$ , small,  $n = 779$ )

# SASS Is Negligibly Correlated With Distance From The Turbines

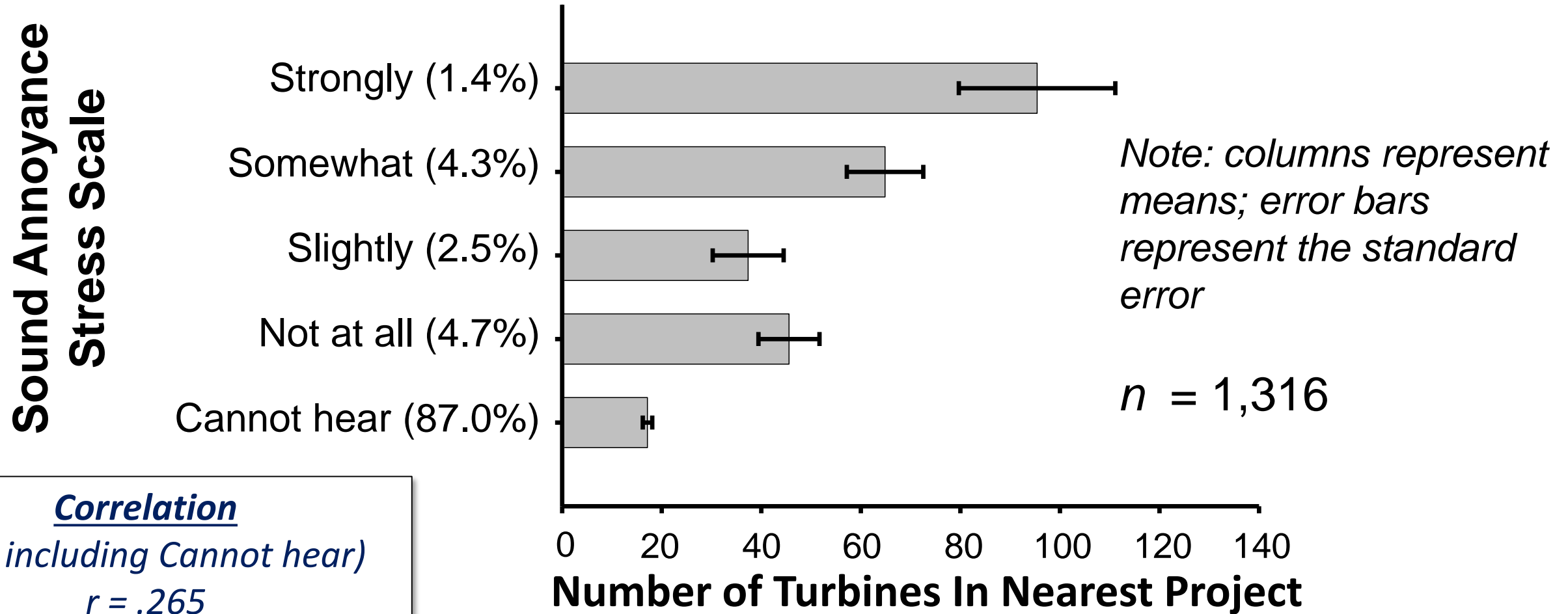


# Number Of Turbines Visible From The Property Is Negligibly Correlated With SASS, Though Strongly Annoyed See More



**Correlation**  
(Not including Cannot hear)  
 $r = .138$   
( $p < .0001$ , small,  $n = 743$ )

# Number Of Turbines In The Nearby Project Is Negligibly Correlated With SASS With Stronger Annoyance Near Larger Projects



**Correlation**  
(Not including Cannot hear)  
 $r = .265$   
( $p < .0001$ , small,  $n = 779$ )

# U.S. Present Attitude Toward Wind Project And Annoyance Toward Planning Process Are Strongly Correlated With SASS

Predictor (see notes)	Coefficient	Beta	p-value
Present attitude towards wind farm	−.334	−.431	< .0001
Annoyed by planning process	.188	.289	< .0001
Process was fair	−.053	−.077	.100
Sensitive to noise	.093	.102	.004
Acute health problems, not wind	.010	.011	.781
Chronic health problems, not wind	−.009	−.011	.781
Distance (miles)	−.069	−.021	.501
Total number of turbines in nearest project	.001	.071	.036

**N = 396, R<sup>2</sup> adjusted = .614, VIF < 2.9, unweighted sample**

*Notes: Demographic variables were also included, such as: age, gender, education, income and race. None were strongly correlated.*

# Conclusions

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- Overall U.S. annoyance is rather low and the number of strongly annoyed residents is few.
- Strongly annoyed residents report stronger negative attitude, stronger planning process annoyance, and less fair planning process.
- The WT sound annoyance and shadow flicker annoyance are between “slightly” and “moderately” in U.S. and Europe while the maximum average annoyance of other emissions is “slightly”.
- Attitudes towards U.S. wind projects are somewhat positive but less positive than in Europe.
- Attitudes and annoyance by the planning process explain 61% of the variation in U.S. WT sound annoyance stress, though direction of the causation is unclear.
- Physical parameters such as distance and demographic characteristics do not explain U.S. WT sound annoyance stress.
- The comparable overall result patterns in the U.S. and Europe support the reliability of both sets of findings.

# Researcher Takeaways

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- Because of the strong link between symptoms, annoyance and perceived planning process fairness, though accepting unclear causation, any efforts to improve the process might greatly help to reduce annoyance and related symptoms. Examples include early and informal participation of residents and consideration of their concerns (e.g., see Firestone, et al., 2017 using this same sample for more discussion)
- It appears that sound and shadow flicker regulations are being applied correctly, and that should continue and be strengthened where possible, potentially addressing sound qualities not presently addressed (such as frequency modulation).
- To better understand annoyance, long term monitoring of residents might be useful to collect information on sound parameters, amplitude modulation, stress indicators, and situational conditions. This might lead to possible mitigation procedures.

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# Upcoming Outreach & Next Steps

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## Upcoming Outreach

- Austrian Wind Energy Association (Vienna, March 2018)
- AWEA Siting and Compliance Conference (Memphis, March 2018)
- IEA Wind Task 28 meeting (Copenhagen, March 2018)
- European Wind Summit, WindEnergy Hamburg (September 2018)



*source: hingemarketing.com*

## Next Steps

- Submit additional journal papers (spring/summer 2018)
- Release the analysis data & survey instrument (fall 2018)

# Questions?

Gundula Hübner: [gundula.huebner@psych.uni-halle.de](mailto:gundula.huebner@psych.uni-halle.de)

Johannes Pohl: [johannes.pohl@psych.uni-halle.de](mailto:johannes.pohl@psych.uni-halle.de)

Ben Hoen: [bhoen@lbl.gov](mailto:bhoen@lbl.gov)

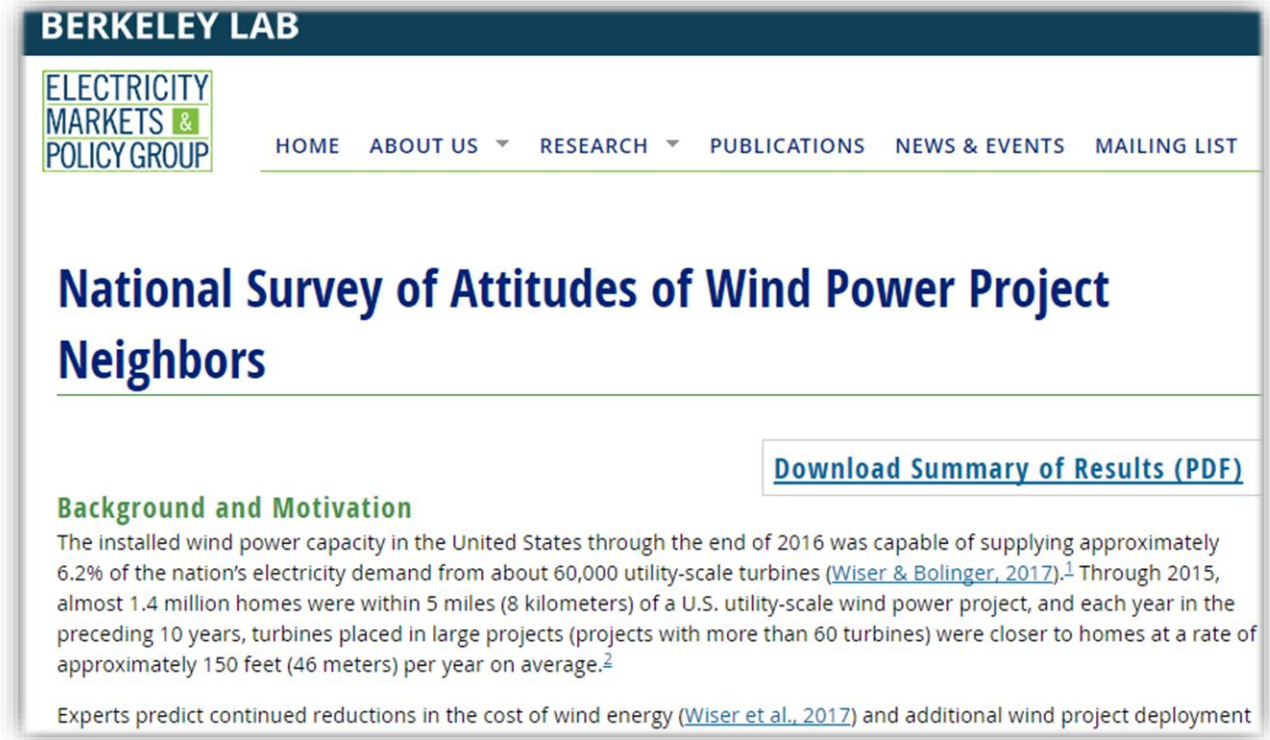
Visit the project webpage for more info and updates

<https://emp.lbl.gov/projects/wind-neighbor-survey>

If you wish to cite these results use the following:

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*This work is supported by the US DOE Wind Energy Technologies Office*



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# Supplemental Slides

# Overall, Relatively Low Annoyances: In The U.S., Sounds Rate As The Most Annoying On Average (*Slide 24 Statistics*)

<i>Mean (SEM)</i> <i>n</i>	<b>U.S.</b>	<b>Europe</b>	<b>Effect size</b> <b><i>p</i>-value</b>
Shadow flicker (limited to those experiencing flicker on property)	1.25 (0.07) 454	1.98 (0.24) 46	small (0.46) .002
Lighting	0.47 (0.03) 1397	1.16 (0.05) 752	medium (0.52) < .0001
Landscape change	0.70 (0.03) 1414	1.35 (0.05) 1024	small (0.46) < .0001
Sound (limited to those that can hear sounds on property)	1.44 (0.06) 779	1.46 (0.09) 264	not relevant (0.01) .851
Traffic (not specific to wind)	1.26 (0.04) 1422	1.32 (0.10) 211	not relevant (0.04) .515
Agricultural machinery	0.33 (0.02) 1382	1.39 (0.09) 212	large (1.02) < .0001

# U.S. Respondents Have Lower Acute And Chronic Health Problems And Less Noise Sensitivity

<i>Mean (SEM) n</i>	<b>U.S.</b>	<b>Europe</b>	<b>Effect size <i>p</i>-value</b>
Acute health problems in 4 weeks, not wind	0.64 (0.03) 1388	1.20 (0.03) 1010	medium (0.50) < .0001
Chronic health problems, not wind	0.70 (0.03) 1384	1.08 (0.04) 1007	small (0.33) < .0001
Noise sensitivity	1.66 (0.03) 1431	2.01 (0.05) 710	small (0.28) < .0001

*Scale: 0 (not at all) to 4 (very)*

# Overall Few Take Action; U.S. Residents Took Slightly More Supportive and Slightly Less Opposing Actions

	U.S.	Europe
Supportive action	12.5%	6.9%
Opposed action	4.4%	9.6%
<i>n</i>	1441	679

*Note: Some differences in percentages might be due to differences in the survey questions regarding actions. The US survey question was answered by only the respondents that were in the community before the project’s construction and who were aware of the planning process, while the European questions were answered by all respondents that might have taken action before or after construction.*

# Sound Annoyance (not SASS) Is Uncorrelated to Wind Project Characteristics, But Is To Planning Process And Attitude

Pearson Correlation ( <i>p</i> -value) <i>n</i>	U.S.	Europe
Distance to nearest turbine	.154 (< .0001) 779	−.105 (.007) 650
Sound pressure level, day	.140 (.023) 264	.271 (.001) 147
Number of turbines in the nearest project	.202 (< .0001) 779	.113 (.004) 650
Planning process fairness	−.622 (< .0001) 461	−.430 (< .0001) 585
Planning process annoyance/stress	.734 (< .0001) 506	.373 (< .0001) 639
Present attitude towards wind project	−.706 (< .0001) 773	−.674 (< .0001) 647

# European Symptoms Related To Annoyances Are Also Rare; Higher Than U.S. For Sound, But Lower For Others

## Europe Only

## Turbine Annoyances

Reported Symptoms Occurring At Least Monthly	Sound	Landscape Change	Lighting	Shadow Flicker
<i>n</i>	679	467	887	467
Being in a bad mood	4.1%	0.4%	0.3%	0.0%
Anger	4.0%	0.4%	0.0%	0.0%
Lack of concentration	3.7%	0.0%	0.3%	0.2%
Difficulty falling asleep	4.6%	0.0%	1.0%	0.0%
Otherwise not sleeping well	4.7%	0.0%	0.8%	0.0%

# SASS Appears Less Related to Wind Project Characteristics, But More To Planning Process And Attitude; U.S. and E.U. Very Similar

Pearson Correlation ( <i>p</i> -value) <i>n</i>	U.S.	Europe
Distance to nearest turbine (excluding those that cannot hear)	.197 (< .0001) 779	.057 (.357) 261
Sound pressure level, day (excluding those that cannot hear)	.116 (.060) 264	.204 (.016) 139
Number of turbines in the nearest project	.365 (< .0001) 1316	.398 (< .0001) 648
Planning process fairness	−.395 (< .0001) 639	−.397 (< .0001) 565
Planning process annoyance/stress	<b>.490</b> (< .0001) 709	<b>.467</b> (< .0001) 620
Present attitude towards wind project	−.362 (< .0001) 1294	− <b>.620</b> (< .0001) 644

# References

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- Hübner & Löffler (2013) *Wirkungen von Windkraftanlagen auf Anwohner in der Schweiz: Einflussfaktoren und Empfehlungen (which translates to: Impact of Wind Turbines of Residents in Switzerland: Impact Factors and Recommendations)*. Institut für Psychologie der Martin-Luther-Universität Halle-Wittenberg, Germany. Research Report
- Pohl, J., G. Hübner, A. Mohs (2012) *Acceptance and Stress Effects of Aircraft Obstruction Markings of Wind Turbines*. Energy Policy, 50 (November): 592–600.
- Pohl, J., J. Gabriel, G. Hübner (2018) *Understanding Stress Effects of Wind Turbine Noise – The Integrated Approach*. Energy Policy, 112 (January): 119–128.